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ABSTRACT

This paper describes the Computer Based Learning Lab (CBLL) at Old Dominion University (ODU) as a component of the ODU-Comprehensive Assistance to Undergraduate Science Education (CAUSE) Project. Emphasis is directed to the structure and management of the facility and to the software under development by the staff. Serving the ODU-CAUSE User Group with respect to their programming needs is a predominate role of the CBLL. Other functions are briefly described, e.g., serving as a university-wide resource center for educational computing, implementing computer graphics as an educational resource, and providing computer facilities for other university users. It is explained that, although a comprehensive utilization study has not yet been undertaken, the reaction of faculty who have used the system has been favorable. Samples of files are provided to illustrate the flexibility and functional structure of the Computer Managed Instruction (CMI) system, e.g., adding a set of scores from a machine scored test, adding a set of scores from terminal input, creating a histogram of the first test, and modifying a student record in the roll file. (VT)

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ODU-CAUSE: COMPUTER BASED LEARNING LAB

by

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

IR006279

ODU-CAUSE: COMPUTER BASED LEARNING LAB

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The purpose of this paper is to describe the Computer Based Learning Lab at Old Dominion University as a component of the ODU-CAUSE Project. Emphasis is directed to the structure and management of the facility and to the software under development by the staff of the facility.

The ODU-CAUSE Project is a response to the unique educational problems of a growing urban university and of its students as identified by the faculty of the School of Sciences and Health Professions. A typical profile of one of Old Dominion University's 14,000 students is one who commutes to school and has additional responsibilities involving employment and family. The institution has doubled in size since 1969 when it became the regional university of eastern Virginia, and consequently it is short of adequate funding, space, and facilities.

The major educational problems that the ODU-CAUSE Project is helping to solve are as diverse as the faculty and student body it serves. Among these problems are: basic mathematics skill deficiencies and consequently high withdrawal/failure rates in fundamental science courses; lack of personalized instructional facilities; difficulty in managing the records and rolls in large lecture sections (350 students per section is common); no educational graphics facilities and personnel and a very limited audio/visual equipment and software inventory; insufficient computer facilities (hardware and software) coupled with a small educational programming staff; and a complete lack of evaluation of educational techniques and outcomes.

In order to solve these problems the three year ODU-CAUSE Project has been funded by the university (56%) and the National Science Foundation (44%) for a total of $682,906.00. The NSF funds come under the auspices of their program for Comprehensive Assistance to Undergraduate Science Education (CAUSE). The project has four basic components: the Learning Resource Center (LRC); the Computer Based Learning Lab (CBLL); the Steering Committee; and the User Group. The Steering Committee directs the activites of the project and is composed of faculty from the various schools meeting with the directors of the Computer Center, the Instructional Media Center, the Center of Institutional Development and a representative from the Student Senate. In addition to staffing responsibilities and project leadership, the Steering Committee funds individual faculty projects (the User Group) in a way consistent with solving the educational problems of the institution.

The LRC was created as a means by which students on their own schedule may review and study course materials, remediate deficiencies and take achievement examinations. The CBLL design is patterned after a similar facility developed at the University of Wisconsin-Milwaukee and is charged with assisting the faculty User Group in the use of educational technology in such a way as to provide solutions to the problems encountered by that group.

The CBLL and LRC were established in January, 1977 in adjoining offices. The proximity of this arrangement allows for single management of both facilities and is also beneficial due to the combined use of the CBLL and the LRC in activities being carried out by members of the User Group. The CBLL is staffed by a lead programmer/analyst, two programmers, a graphics illustrator, and an administrative secretary. The lead programmer/analyst is responsible for management of the facility and direction of the programmming activities of the CBLL. In addition, student assistants are employed to monitor use of the LRC and for data input requirements of the CBLL. Serving the ODU-CAUSE User Group with respect to their programming needs is a predominate role of the CBLL; however, the CBLL is also responding to the needs of the university in several other ways.

The CBLL is becoming known as a university-wide resource center for educational computing. Periodicals and proceedings from various educational sources are housed in the CBLL and are available for inspection by the university faculty. Also on hand are materials describing available educational courseware (i.e., Wang's INDEX TO COMPUTER-BASED LEARNING and CONDUIT materials). The programming staff supplies assistance in identifying, transporting and implementing available courseware for interested faculty. It

is worthwhile noting that faculty do not need to possess programming experience to use available courseware. The CBLL staff provides the technical interface necessary to utilize educational computer technology.

The ODU-CAUSE Project is also committed to the implementation of computer graphics as an educational resource. An electrostatic printer/plotter was purchased with project funds for use by the User Group and the university. The CBLL staff is working in conjuction with the staff of the Computer Center in implementation of the graphics software and in adding the device to the computer system.

ODU's Computer Center has a Digital Equipment Corporation DECsystem-10 which serves as the principle computing facility for administrative, research, instructional and educational users at the university. The installation is in a period of growth and development which, unfortunately, is lagging behind the current demand for its services. The CBLL objectives of implementation of computer assisted instruction (CAI) and computer managed instruction (CMI) accentuate the necessity for expansion of the installation which currently supports a maximum of 45 time-sharing users and 5 batch jobs . The project is hopefully serving as a catalyst in this effort through the major funding of a disk drive, the printer plotter, additional time-share ports, and an optical reader. The optical reader has proved to be an important resource for the entire university by providing a great improvement in the capability for machine read surveys and examinations. The limitations of the installation have put restraints on the implementation of CAI courseware; thus emphasis in program development is toward software which can be used within the current configuration. Implementation of a computer managed instruction system was considered feasible within the given constraints and a CMI system satisfied a project goal of providing an alternative form of class record management.

INTERACTIVE COMPUTER MANAGED INSTRUCTION

A group of programs were developed in 1975 by Dr. G. E. Copeland to provide general statistics, histograms, and updating of scores entered on a course roll file. These programs were used as the base in the development of the ODU-CAUSE CMI system. It was desired to make the programs accessible to a large number of faculty. Execution of the programs by the instructors themselves was considered essential for the CMI system to become a viable alternative to course record management on a large scale. In addition,

the system had to be easy to operate to make it accessible to the instructor who was a novice user of the computer. The ease of access and execution desired was accomplished in two ways. First, extensive error proofing of inputs during the user dialog minimized user entry errors. Secondly, the development of a control program greatly reduced the complexity of an interactive CMI session. The control program allows execution of any of the components of the CMI system as a functional input to the program. Thus, an instructor needs only to execute the control program during an interactive session to perform a number of the CMI functions. The control program was made possible by the 'CHAIN' command of BASIC-PLUS which allows execution of a BASIC program called during execution of another BASIC program.

An important aspect of the CMI system is the interface with computer scored testing. Instructors opting for examinations using multiple choice, true-false, or list matching can have the answer sheets optically scanned and computer scored. A disk file created during computer scoring containing student identification and scores can then be merged into the course roll file using the CMI system . This is particularly useful for large classes where data input of scores may be a significant factor in considering adoption of a CMI system of grade management.

Another useful characteristic of the CMI system is related to its interactive nature. The system is designed to be run on-line from either a hardcopy terminal or from a CRT. A hardcopy terminal creates a paper copy of the desired output but printing is generally slow. The CRT terminal outputs information at a faster rate but does not create a paper copy. To account for the differences in the available terminals and to accentuate the advantages of each, the CMI system outputs requested information at the user's discretion either to the user terminal or writes the information to a disk file for later output on a fast line printer.

UTILIZATION and COMMENTS

In the spring, 1977 semester 9 instructors utilized the CMI system to manage grades in 15 classes affecting 1000 students. Utilization has more than doubled during the second semester of the CMI system's availability. Although a comprehensive utilization study has not been undertaken, the reaction of faculty who have used the system has been favorable. Feedback to the CBLL staff has included many recommendations on how the system might be improved; most of these recommendations have been added to the system. The

criteria used in modifying the system is in determining if the changes will have general use by others as opposed to a specific use by a single user. Repeat usage of the system by most of the original users is another indication of general acceptance of the system. Although we are noting moderate success in acceptance of the CMI system, there are problems which must be overcome before the system will become a widely used resource.

We noted earlier that the status of the installation limited our approach to CAI activities. The installation also is having a direct effect on the CMI system utilization. A common complaint by users is that during peak usage hours (9 am to 6 pm) the computer is running at full job capacity and no other time-share users may gain access to the machine. Easy access was considered a requirement for the success of the system and nonavailibility of the computer during the business day is having a direct effect on utilization. The favorable attitude concerning the system has come from faculty who have accepted the limitations of the computer and use the system during off hours. Faculty with little or no computer experience must be comfortable with how to gain access to and use the CMI system for them to accept it for their course record management. This requires some training in how to use a terminal, how to gain access to the computer, how to execute the CMI system, and how to maintain their computer disk areas which contain their records. The ODU-CAUSE Project has sponsored workshops to acquaint faculty with the CMI system and the CBLL provides personal assistance and documentation of the system. It remains for the faculty member to accept the CMI system as an educational resource and make the time necessary to become familiar and comfortable with how to use the system.

In the following example we illustrate the flexibility and functional structure of the CMI system as we add a set of scores from a machine scored test; add a set of scores from terminal input; create a histogram of the first test; and modify a student record in the roll file.

ODU-CAUSE: CBLL

THE FOLLOWING FILE (COURSE.ROL) IS AN EXAMPLE OF A COURSE ROLL FILE NECESSARY AS INPUT TO THE CMI SYSTEM.

```
01000    "SAMPLE-CLASS                "
01010    14
01020    0
01030    147-39-6521 "BROWN J "
01040    001-32-2310 "BURNS JE"
01050    117-43-6932 "DORIGHT D "
01060    229-68-3312 "ELLSWOOD J "
01070    111-22-3333 "GREEN WA"
01080    340-98-6514 "JOHNSON R "
01090    230-88-9988 "KELLY L "
01100    581-73-9125 "RICHARDS M "
01110    342-16-9383 "RONI M "
01120    623-84-9989 "SMITH A "
01130    121-01-4890 "WELLS S "
01140    321-54-9876 "WILLIAMS W "
01150    121-77-8047 "WOOD JO"
01160    340-11-2301 "YOUNG P "
```

THE FOLLOWING FILE (ST2116.294) IS A SAMPLE OF THE GRADE FILE CREATED FROM SCORING AN OPSCAN READ EXAMINATION. THE COLUMNS CONTAIN THE RAW SCORE, ABSOLUTE SCORE, RELATIVE SCORE AND STANDARD SCORE, RESPECTIVELY.

```
BROWN       JOHN    147396521     5    50.0    50.0      405
BURNS       JOY  E  001322310     5    50.0    50.0      405
DORIGHT     DUDLEY  117436932    10   100.0   100.0      738
ELLSWOOD    JEAN    229683312     5    50.0    50.0      405
GREEN       WILLIA  421384221     7    70.0    70.0      538
JOHNSON     ROBERT  340986514     7    70.0    70.0      538
KELLY       LISA    230889988     5    50.0    50.0      405
RICHARDS    MARTHA  581739125     8    80.0    80.0      605
RONI        MAC     342169383     8    80.0    80.0      605
SMITH       ALLEN   623849989     5    50.0    50.0      405
WELLS       SUSAN   121014890     5    50.0    50.0      405
WILLIAMS    WILL    321549876     7    70.0    70.0      538
WOOD        JIM  O  121778047     7    70.0    70.0      538
YOUNG       PHIL    340112301     6    60.0    60.0      471
```

```
ODU-CAUSE: CBLL


     .R BASIC
READY, FOR HELP TYPE HELP.
       OLD DAS:ROLPRG.CMI
READY
       RUN
ARE YOU FAMILIAR WITH THIS SYSTEM ?
       NO
THIS SYSTEM IS A SERIES OF PROGRAMS DESIGNED TO
MAINTAIN AND ANALYZE A ROLL FILE. THE PROGRAMS
AVAILABLE ARE;
ALPHA    - ALPHABETIZE ROLL FILE
UPDATE   - TO ADD A SET OF SCORES TO THE
                ROLL FILE FROM THE TERMINAL.
MODIFY   - ALLOWS COMPREHENSIVE EDITING
                OF A ROLL FILE.
RANK     - CREATE A LISTING OF THE ROLL
                FILE SORTED ACCORDING TO THE
                USER'S REQUESTS.
TESAVG   - GENERATE SCORE AVERAGES OR
                SUM STRING OF SCORES ON ROLL FILES.
STATNW   - USED AFTER TESAVG TO PROVIDE
                STATISTICAL INFO ON STUDENTS'
                SCORES AND AVERAGES.
HISTGR   - PRINT HISTOGRAMS OF STUDENT
                SCORES FROM ROLL FILE.
MERGE    - TO ADD A SET OF SCORES TO THE
                ROLL FILE FROM AN OPSCAN
                CREATED FILE (ST FILE).
FILES    - CREATE/UPDATE A ROLL FILE WITH SCORES FROM
                ANOTHER ROLL FILE
ROLPRG   - THIS PROGRAM.  IT IS DESIGNED
                TO ALLOW THE USER TO USE THE
                ABOVE PROGRAMS WITHOUT EXTENSIVE
                COMPUTER EXPERIENCE.

THE FOLLOWING PROGRAMS ARE ALSO AVAILABLE
ROLGEN   - FORTRAN PROGRAM TO CREATE
                INITIAL ROLL FILE FROM AN OPSCAN
                CREATED FILE.
FMAKE    - FORTRAN PROGRAM TO CREATE ROLL
                FROM ENROLLMENT RECORDS

DO YOU NEED INFO ABOUT THE ROLL FILE FORMAT ?
       YES
THE ROLL FILE IS A LINE-NUMBERED FILE THAT
CONTAINS 1 OR MORE LINES PER STUDENT PLUS 3 LINES
AT THE BEGINNING THAT CONTAIN INFO ABOUT THE FILE.
LINE1 - COURSE-NAME
LINE2 - NUMBER OF STUDENTS
LINE3 - NUMBER OF SCORES PER STUDENT
LINE4 - DESCRIPTION OR FIRST SCORE ON FILE
.................
.................
LINE(4+N) - DESCRIPTION OF N'TH SCORE ON FILE
```

```
ODU-CAUSE: CBLL


        FOR      ! STUDENT NUMBER  "STUDENT NAME"
        EACH     !       SCORE 1 ... SCORE N
        STUDENT !
        WHERE STUDENT NUMBER HAS FORM NNN-NN-NNNN
        AND STUDENT NAME HAS FORM "LASTNAME FM"
        (F=FIRST INITIAL, M=MIDDLE INITIAL)


        THE ROLL FILE CAN BE CREATED USING ANY LINE-ORIENTED
        TEXT EDITOR (SUCH AS BASIC'S) OR BY USING THE ROLGEN
        OR FMAKE PROGRAMS

        THE COMMANDS TO PERFORM VARIOUS
        FUNCTIONS ARE;
        HELP     - FOR THIS LIST
        ALPHA    - ALPHABETIZE ROLL FILE
        UPDATE   - TO ADD SCORES (BY HAND)
        MODIFY   - TO EDIT ROLL FILE
        RANK     - TO SORT AND LIST
        TESAVG   - TO GENERATE AVERAGES
        STATNW   - TO PROVIDE STATISTICS
        HISTGR   - TO GENERATE HISTOGRAMS
        MERGE    - MERGE OPSCAN GRADED FILE (ST?.? FILE)
        FILES    - CREATE/UPDATE A ROLL FILE FROM ANOTHER ROLL FILE
        STOP     - EXIT FROM SYSTEM


        PLEASE INPUT ROLL FILE NAME ?
               COURSE.FOL


        FUNCTION: ?
               MERGE
        INPUT A NAME FOR THE FILE CONTAINING MATCH ERRORS       ?
               MERGE.ERR
        INPUT THE NAME OF THE OPSCAN GRADE FILE ?
               ST2116.294
        INDICATE WHICH GRADE YOU WISH TO MERGE FROM THE FILE:
        TYPE     1 FOR RAW SCORE
                 2 FOR ABSOLUTE SCORE
                 3 FOR RELATIVE SCORE
                 4 FOR STANDARD SCORE    ?
                2

        CLASS NAME IS SAMPLE-CLASS
        14  STUDENTS ARE ON THE ROLL
        0  GRADES ARE CURRENTLY ON THE ROLL

        INPUT (<=72 CHAR) DESCRIPTION OF TEST BEING MERGED      ?
               SAMPLE TEST 1

        REMEMBER - MATCH ERRORS ARE CONTAINED IN FILE MERGE.ERR

        EXIT FROM MERGE
```

```
ODU-CAUSE: CBLL


        FUNCTION: ?
               UPDATE

        UPDATE - ADD TEST GRADES TO ROLL FILE

        THE CLASS IS SAMPLE-CLASS
        THERE ARE  14 STUDENTS
        THERE ARE  1  TESTS ALREADY ON THE GRADE BOOK

        DO YOU WANT TO ADD GRADES (YES OR NO) ?
               YES
        HOW MANY GRADES TO BE INPUT FOR EACH STUDENT    ?
               1
        INPUT (<= 72 CHAR) DESCRIPTION OF GRADE  1  TO BE ENTERED
      ?
               SAMPLE TEST 2

        NOW WE MUST ADD IN THE GRADES FOR EACH STUDENT
        I WILL GIVE THE STUDENT NAME ;HIS TEST SCORES AND A ?
        THEN ENTER THE NEW SCORE(S) AND <RETURN>
        IF NO TEST ENTER -1

        BROWN J                  50  ?         60
        BURNS JE                 50  ?         65
        DORIGHT D               100  ?         95
        ELLSWOOD J               50  ?         85
        GREEN WA                 -1  ?         70
        JOHNSON R                70  ?         70
        KELLY L                  50  ?         70
        RICHARDS M               80  ?         80
        RONI M                   80  ?         90
        SMITH A                  50  ?         60
        WELLS S                  50  ?         65
        WILLIAMS W               70  ?         85
        WOOD JO                  70  ?         60
        YOUNG P                  60  ?         80

        EXIT FROM UPDATE
```

```
ODU-CAUSE: CBLL

        FUNCTION: ?
              HISTGR

        HISTGR - CREATES HISTOGRAMS FROM CLASS ROLL

        CLASS IS SAMPLE-CLASS
        THERE ARE  14  STUDENTS
        THERE ARE 2 GRADES ON THE ROLL

        FOR WHICH TEST DO YOU DESIRE A HISTOGRAM
        INPUT 0 FOR HISTOGRAM OF AVERAGE SCORE FROM TESAVG      ?
              1
        DO YOU WANT TO SAVE THE OUTPUT IN A DISK FILE ?
              NO
        INPUT INCREMENT BETWEEN UNITS FOR THIS HISTOGRAM        ?
              5


        SAMPLE TEST 1
        SCORE          NUMBER OF PEOPLE              TEST NUMBER 1
        50            ******
        55
        60            *
        65
        70            ***
        75
        80            **
        85
        90
        95
        100           *
        1 PEOPLE DID NOT RECEIVE GRADES
        0 PEOPLE RECEIVED ZERO GRADES
        DO YOU WISH TO CREATE ANOTHER HISTOGRAM ?
              NO

        EXIT FROM HISTGR

        FUNCTION: ?
              STOP
        READY
             MONITOR
        .
             TYPE MERGE.ERR

        THESE STUDENTS ARE IN THE GRADE FILE ONLY
        421384221    GREEN WILLIA A                  70
        THESE STUDENTS WERE IN THE ROLL FILE
        111-22-3333    GREEN WA                -1


             MATCH ERRORS ARE CORRECTED USING THE MODIFY FUNCTION
```

```
ODU-CAUSE: CBLL


        FUNCTION: ?      MODIFY
        MODIFY - ROLL FILE EDITOR
        ARE YOU FAMILIAR WITH THIS PROGRAM ?     NO

        THIS PROGRAM ALLOWS THE USER TO
        EDIT A ROLL BOOK FILE.
        CAPABILITIES INCLUDE -
        1) ADD/DROP STUDENTS
        2) MODIFY RECORDS
        ALL THE FUNCTIONS WORK ON THE
        BASIS OF THE STUDENT NUMBER
        OR NAME AS THE PROGRAM PROMPTS
        THE USER FOR ADDITIONAL INFO.

        MODIFY FUNCTIONS INCLUDE:
        HELP     - FOR THIS LIST
        LIST     - LIST A STUDENT ENTRY
        ADD      - ADD A STUDENT
        DROP     - DROP A STUDENT
        CHANGE   - TO CHANGE PART OF A STUDENT RECORD
        STOP     - TO WRITE OUT UPDATED FILE AND EXIT

        ABBREVIATIONS FOR FUNCTION NAMES ARE ACCEPTABLE
        THE ARGUMENT FOR A FUNCTION MAY BE TYPED ON
        THE SAME LINE AS THE FUNCTION NAME.

        CLASS NAME IS SAMPLE-CLASS
        14 STUDENTS ARE ON THE ROLL
        2 GRADES ARE CURRENTLY ON THE ROLL FILE

        MODIFY: ?        CHANGE
        CHANGE:STUDENT NAME, NUMBER, OR STOP ?
        GREEN WA
        111-22-3333   GREEN WA       -1  70
        CHANGE ?         H
        TYPE;
        H FOR HELP
        N TO CHANGE NAME
        S TO CHANGE NUMBER
        G TO CHANGE A GRADE
        Q TO FINISH
        CHANGE ?         S
        STUDENT NUMBER ?         421384221
        CHANGE ?         G
        WHICH GRADE (1 - 2 ) ?  1
        INPUT GRADE ?   70
        CHANGE ?         Q
        421-38-4221   GREEN WA        70  70
        CHANGE:STUDENT NAME, NUMBER, OR STOP ?
        STOP
        MODIFY: ?        STOP

        EXIT FROM MODIFY
```